LSASD Project ID: 19-0253

Sample and Analysis Plan

Phase 2: Prioritization of PFAS Contributions to Weiss Lake

Cherokee County Alabama & Floyd County Georgia

Project Date(s): May 20th – May 24th, 2019

Final SAP Approval Date: May 15, 2019

LABORATORY SERVICES & APPLIED SCIENCE DIVISION

LSASD

Project Leader: Nathan Barlet
Environmental Sampling Section
Applied Science Branch
Laboratory Services & Applied Science Division
USEPA – Region 4
980 College Station Road
Athens, Georgia 30605-2720

The activities depicted in this Sampling and Analysis Plan (SAP) are accredited under the US EPA Region 4 Laboratory Services & Applied Science Division ISO/IEC 17025 accreditation issued by the ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation AT-1644.

THIS PAGE IS LEFT INTENTIONALLY BLANK

Project Requestor:

Brian Smith, Chief
Safe Drinking Water Branch
Water Division
USEPA – Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Analytical Support:

Laboratory Services Branch
Laboratory Services & Applied Science Division
USEPA – Region 4
980 College Station Road
Athens, GA 30605-2720

Approvals:

LSASD Project Leader:

5/15/19
Date

Nathan Barlet
Environmental Sampling Section
Applied Science Branch

Approving Officials:

5/15/2019
Date

Greg White, Technical Reviewer
Environmental Sampling Section
Applied Science Branch

5/15/19
Date

Stacey Box, Chief
Environmental Sampling Section
Applied Science Branch

This Sample and Analysis Plan (SAP) is designed to be used in conjunction with the *Applied Science Branch Quality Assurance Project Plan* (USEPA, 2018*a*).

Table of Contents

SECTION A: Project Planning Elements		
A1. Distribution List		
Recipient	**Organization**	**Address/Email**
Brian Smith	USEPA Region 4 Water Division	64 Forsyth St. SW Atlanta, Georgia 30303-8960 Smith.Brian@epa.gov
Becky Allenbach	USEPA Region 4 Water Division	64 Forsyth St. SW Atlanta, Georgia 30303-8960 Allenbach.Becky@epa.gov
Renea Hall	USEPA Region 4 Water Division	64 Forsyth St. SW Atlanta, Georgia 30303-8960 Hall.Renea@epa.gov
Danny France	US EPA Region 4 Laboratory Services & Applied Science Division	980 College Station Road Athens, Georgia 30605-2720 France.Danny@epa.gov
Scott Sivertsen	US EPA Region 4 Laboratory Services & Applied Science Division	980 College Station Road Athens, Georgia 30605-2720 Sivertsen.Scott@epa.gov
A2. Project Personnel		
Team Members[1,2]	**Organization**	**Responsibilities**
Nathan Barlet	EPA/R4/LSASD	Project Leader
Jerry Ackerman	EPA/R4/LSASD	Team Leader/Sampler
Morris Flexner	EPA/R4/LSASD	Safety Officer/Sampler
Sue Dye	EPA/R4/LSASD	Sampler
Pete Kalla	EPA/R4/LSASD	Sampler
Greg White	EPA/R4/LSASD	Sampler

[1] Project team members subject to change due to scheduling conflicts.

[2] Project Leader and all Task Leaders assisting with this project have been deemed competent by LSASD management, under ISO 17025 accreditation, to conduct the tasks required to fulfill the prescribed goals.

A3. Site Description and Background Information

The headwaters of the Coosa River basin begin in Tennessee and the North Georgia Mountains as the Conasauga, Coosawattee, and Etowah Rivers. The confluence of the Conasauga and the Coosawattee form the Oostanaula River south of Dalton Georgia before converging with the Etowah River forming the Coosa River in Rome Georgia. The Coosa River flows west across the Alabama-Georgia state line and is then impounded in Leesburg Alabama to form Weiss Lake. Along with the Coosa River, Weiss Lake is fed by the Chattooga River, Little River, and numerous smaller tributaries draining a significant portion of Northeastern Alabama and Northwestern Georgia. Weiss Lake is a significant recreational and hydroelectric resource and serves as the municipal drinking water supply for the City of Centre Alabama and surrounding townships.

Weiss Lake and two of its main tributaries (i.e., Chattooga and Coosa Rivers) have historically tested positive for the presence of per- and polyfluoroalkyl substances (PFASs) via monitoring studies conducted by the Alabama Department of Environmental Management (ADEM), the Georgia Environmental Protection Division (GAEPD), and the U.S. EPA Region 4's Laboratory Services & Applied Science Division (LSASD). PFASs are man-made chemicals that do not occur in nature and have been found to be persistent and accumulate in both the environment and the human body via exposure pathways such as consumption of contaminated food and drinking water. PFASs have been extensively used in industry, manufacturing of commercial products, and most notoriously in firefighting foams in the form of AFFF. There is evidence that suggests exposure to PFASs can lead to adverse health effects and are an emerging concern to public health. PFAS is a generic nomenclature encompassing a broader array of chemicals, with the most studied being perfluorooctanoic acid (PFOA) and perfluorooctanesulfonate (PFOS). The U.S. EPA has issued a Recommended Health Advisory for drinking water of 70 ng/L (ppt) for combined concentrations of PFOA and PFOS compounds. Extensive information regarding PFASs can be found at http://www.epa.gov/pfas.

A4. Problem Definition

Exceedances of the U.S. EPA's Recommended Health Advisory for PFOA and PFOS have been observed at both the drinking water intakes for the City of Centre Alabama in Weiss Lake and further downstream on the Coosa River in the City of Gadsden Alabama. Data collected by ADEM from 2016 through 2019 observed positive detections of both PFOA and PFOS in Weiss Lake, the Chattooga River, and on the Coosa River (both downstream and upstream of the lake). Studies conducted by GAEPD in 2012 and 2016 tested positive for PFOA and PFOS compounds in the Conasauga River and the receiving waters of the Oostanaula and Coosa Rivers. A subsequent study conducted by LSASD in 2018 observed positive detections of PFOS in the upper Chattooga watershed. PFOA was not detected in the 2018 study conducted by LSASD. The 2018 sampling of the Chattooga River by LSASD was conducted during an extreme high flow event thus dilution effects may have been a factor (USEPA, 2018*c*). Background concentrations of PFASs for the remaining tributaries of Weiss Lake and estimates of mass loading rates to the system are currently unknown.

This study will observe background concentrations of PFASs for all main inputs to Weiss Lake in conjunction with volumetric flow measurements to provide estimates of instantaneous mass loading rates for a broader picture of system-wide contributions of PFASs. This study will also include profiling stations and additional water quality parameters to investigate both the vertical distribution of observed PFASs within the lake water column and correlation with other contaminants of concern. Data from this study will be used by the U.S. EPA Region 4's Water Division (WD) and LSASD to identify and prioritize the watersheds of Weiss Lake impacted by PFASs and inform future studies within the broader Coosa River basin.

A5. Project Description, Goals, and Study Boundaries

Study Goal:

Prioritize PFAS inputs into Weiss Lake which contribute to exceedances of the EPA Health Advisory for PFOA/PFOS at the Public Water System intakes for the cities of Centre and Gadsden Alabama.

Study Objectives:

1. Determine the relative source contributions of PFASs to Weiss Lake at a watershed scale by measuring PFAS mass loading rates for all inflowing tributaries.

2. Investigate potential root causes and contributing sources of PFASs in Weiss Lake by determining if correlations between observed concentrations of PFASs and other surface water contaminants exist.

3. Determine if observed concentrations of PFAS compounds are homogenously distributed throughout the water column of Weiss Lake or if discrepancies between surface and near sediment concentrations of PFASs are present via vertical profiling at select locations.

Study Area:

The study area for this project includes Weiss Lake and all its main tributaries in Cherokee County Alabama and Floyd County Georgia (Figure 1). A total of 22 sites will be assessed which includes 17 inflowing tributary sites, 2 outflowing sites at both Weiss Lake Dams, the public drinking water intakes for Centre City and Gadsden Alabama, and 2 vertical profiling stations located on the surface of Weiss Lake. The dams are the only surface water outlets for Weiss Lake discharging directly into the Coosa River. The inflowing tributaries include 14 named rivers and streams and 3 un-named creeks with drainages adjacent to the Cherokee County Regional and Centre City Municipal Airports. See Table 1 for a description of all proposed sampling sites.

Study Design/Approach:

Standard Operating Procedures for all sampling and field measurement activities outlined in this study plan are referenced in Section B5: Sampling and Measurement Procedures.

PFAS Loading Rates

Surface water samples will be collected at each site and transported to the EPA R4 Laboratory at LSASD in Athens Georgia for the analysis of 25 PFAS compounds listed in Table 6. A corresponding discharge will be either directly measured via handheld or remotely-operated flowmeters or retrieved from USGS gaging stations for each inflowing and outflowing tributary to compute a mass loading rate of detected PFAS compounds.

Surface Water Chemistry Correlations

A study conducted by Gaffney (1976) which characterized wastewaters from the carpet and rug manufacturing industry in the Coosa River basin found the wastewaters to contain significant levels of biphenyls and other organic compounds. Alternatively, a literature review compiled by Bisschops and Spanjers (2003) found that wastewaters from the textile manufacturing industry contained significant concentrations of sulfates, nitrate, total phosphorus, total suspended solids, and total dissolved solids resulting from specific manufacturing processes. Surface water chemistry samples will be collected at each inflowing tributary site including the Centre City and Gadsden public drinking water intakes and analyzed for the parameters listed in Tables 2 through 6. Requirements for sample container, preservation and holding times are listed in Table 7. Additional surface water quality measurements of temperature, dissolved oxygen, specific conductance, turbidity, and pH will be collected in-situ via multi-parameter data sondes at each site. See Table 8 for a detailed list of in-situ water quality parameters. A correlation matrix comparing all parameters collected in this study will be used to elucidate relationships between concentrations of detected PFAS compounds and additional water quality parameters for all 17 inflowing tributaries. Correlation coefficients will be computed via the non-parametric Spearman Rank method to avoid violating assumptions of dataset normality.

Vertical Profiling

Two profiling sites will be established on the surface of Weiss Lake. The profiling sites will be located above the outlet at Weiss Dam on the western portion of the lake and at approximately mid-lake near the Centre City intake. Weiss Lake is relatively shallow and well mixed with an average depth of approximately 10 ft and a hydraulic retention time of 18 days (USEPA, 2004). Three samples will be collected at each profiling station at multiple depths throughout the water column and analyzed for the PFAS compounds listed in Table 6. The samples will be collected near the surface (approximately 6-inches below the water surface), at mid-depth, and approximately 1-foot above the lake sediments using a peristaltic pump equipped with high density polyethylene (HDPE) tubing. Additionally, a multi-parameter data sonde will be used to collect in-situ measurements of the water quality parameters listed in Table 8 at 2-foot intervals to construct a vertical profile of the water column.

Quality Control Samples

Multiple control samples will be collected in accordance with LSASD Standard Operating Procedures and accepted trace-level contaminant sampling practices. Control samples will include trip blanks, field blanks, field equipment rinse blanks, field duplicate samples, and matrix spike/matrix spike duplicate field samples. Surface water samples collected for PFAS analysis will be sampled via the "clean hands/dirty hands" technique to avoid contamination. Sampling materials and field gear known to contain PFASs (e.g. PVC and Gore-Tex®) will be avoided during sampling activities. An outline of all quality control samples is listed in Section B3: Quality Control.

Project Timeline:

All field activities are planned for the week of May 20th, 2019 with the following week of May 27th, 2019 reserved as a wet weather contingency. Due to the volume of the proposed samples and laboratory capabilities the analyses will be conducted in two separate batches. Laboratory turn-around time is 35 days from the processing of the second batch of samples. The draft final report for this study is to be expected 30 days from the receipt of all laboratory analyses on August 7th, 2019.

A6. Applicable Regulatory Information

The U.S. EPA has established a recommended health advisory level for drinking water of 70 parts per trillion for PFOA and PFOS combined. Concentrations of additional water quality parameters listed in Tables 2 through 5 will be used by LSASD scientists for the purpose of constructing a correlation matrix with respect to observed PFAS compounds. Federal and State-specific Water Quality Standards promulgated/approved under the Clean Water Act can be found here: https://www.epa.gov/wqs-tech/state-specific-water-quality-standards-effective-under-clean-water-act-cwa. Water quality results will be provided to the USEPA Region 4 Water Division for determination of further action.

A7. Decision(s) to be made based on data

Prioritized PFAS contributions into Weiss Lake will be used to inform the development of a Phase 3 study plan. A follow-up study could include a refined assessment of sub-watersheds of the Coosa River basin found to be significant contributing sources of PFAS contamination. A Phase 3 study could include activities such as further determinations of mass loadings of PFASs within prioritized watersheds; assessment of PFAS contamination of soil and sediment within areas of concern (e.g. Looper's Bend Land Application Site in Dalton, GA); and/or assessment of legacy versus active sources of PFAS contamination. A Phase 3 study is tentatively planned for the August to September timeframe in FY2019.

SECTION B: Data Generation, Acquisition, and Reporting	
Will samples or physical evidence be collected:	☒ **Yes –** *If yes, complete all subsections in Section B.*
	☐ **No** – *If no, no action needed for B1, B2, B3 or B4, proceed to B5.*

B1. Sampling Design/Information Inputs

Sample Media	Total Number of Samples	Analyses
Surface Water	27 samples + 2 duplicates + 8 QC + 2 MS/MSD	PFASs (See Tables 6 & 7)
Surface Water	19 samples + duplicate + MS/MSD	Semi-volatile Organics & PCBs (See Tables 3 & 7)
Surface Water	19 samples + duplicate	Nitrogen Series (NH_3, NO_3+NO_2, TKN) + Total Phosphorous (See Tables 5 & 7)
Surface Water	19 samples + duplicate	Total Suspended Solids (TSS), Total Dissolved Solids (TDS) + Chloride (Cl-) + Sulfates (See Tables 5 & 7)
Surface Water	19 samples + 2 duplicates + 2 QC + 2 MS/MSD	Volatile Organics (See Tables 4 & 7)
Surface Water	19 samples + duplicate	Metals Routine Scan (See Tables 2 & 7)

B2. Sampling Handling and Custody

As outlined in the *Applied Science Branch Quality Assurance Project Plan* (USEPA, 2018*b*), all samples will be handled and custody maintained in accordance with the LSASD Laboratory Services Branch Laboratory Operations and Quality Assurance Manual, LSASD Operating Procedure for Sample and Evidence Management, SESDPROC-005, and LSASD Operating Procedure for Packing, Labeling and Shipping of Environmental and Waste Samples, SESDPROC-209.

Will a Chain-of-Custody be produced:	☒ **Yes**
	☐ **No**

During the duration of the event, have preparations been made to ensure that custody is maintained? *Custody of a sample or physical evidence is defined as:* • *It is in the actual possession of an investigator* • *It is in the view of an investigator, after being in their physical possession* • *It was in the physical possession of an investigator and then they secured it to prevent tampering* • *It is placed in a designated secure area*	☒ **Yes** ☐ **No**

B3. Quality Control

Field quality control measures will be performed in accordance with the LSASD Operating Procedure for Field Sampling Quality Control, SESDPROC-011.

Field quality control (QC) samples include the following:

- Each batch of samples will contain a duplicate quality control sample for each analysis.
- Each batch of samples being analyzed for PFASs, Semi-VOA, VOA, or PCBs will also contain an additional sample volume for matrix spike/matrix spike duplicates (MS/MSD).
- Each batch of samples being analyzed for VOAs will include trip blanks.
- Temperature blanks will be placed in sample coolers.

The following additional quality control (QC) samples will be collected and analyzed for PFAS contamination:

- Each batch of samples will contain a trip blank to be stored and transported with collected field samples.
- A field blank will be collected at one wadeable sample location and one boat-in sample location.
- A field equipment rinse blank will be collected for all sampling equipment used for PFAS sample collection (e.g. HDPE tubing, HDPE or stainless-steel bailers).
- All blank quality control (QC) samples will be prepared utilizing PFAS-free water supplied by the U.S. EPA LSASD laboratory in Athens, GA.

PFAS sampling protocol:

- A two-person "clean hands – dirty hands" sampling protocol will be used for sample collection at inflowing and outflowing tributary locations. One member of the sampling team will be designated clean hands and another as dirty hands. All operations involving contact with the sample container and sample media will be conducted by the clean hands team member. Dirty hands will conduct all other preparations for sampling.
- A PFAS-free high-density polyethylene (HDPE) tubing will be used for collecting surface water samples at depth for 2 lake profiling stations. A new clean set of HDPE tubing will be used at each sample depth for both profiling stations.
- Sampling materials and field gear known to contain PFASs (e.g. PVC and Gore-Tex®) will be avoided during sampling activities.

Laboratory quality control measures are specified in the *LSASD Laboratory Services Branch Laboratory Operations and Quality Assurance Manual* (USEPA, 2018*b*).

B4. Analytical Methods and Support		
Samples will be analyzed by the EPA/LSASD laboratory in Athens, GA in accordance with the LSASD Laboratory Services Laboratory Operations and Quality Assurance Manual (USEPA, 2018*b*). Specific analytical methods are listed in Tables 2 through 6. Samples submitted to a Contract Laboratory Program (CLP) laboratory will be analyzed in accordance to the current statement of work.		
Laboratory Turn-Around-Time Requested: 35 Days		
Reporting Levels:	☒ Non-Routine Reporting Levels **ARE NOT** Required, No Further Action. ☐ Non-Routine Reporting Levels **ARE** Required, List Below.	
Non-Routine Reporting Levels:		
Waste Samples Anticipated:		☐ **Yes** ☒ **No** ☐ **Unknown**
If answer is yes, specify laboratory to receive samples: (i.e., LSASD, commercial lab vis bank card or PR, subcontracted via START/RACS/REPA 5) Not applicable.		

B5. Sampling and Measurement Procedures

Sampling and measurement activities will be in accordance with the LSASD operating procedures. The following field procedures will be followed during this study, check all that apply: *(Last Update: 4/05/18)*

	Field Measurement Procedures*	**SESDPROC-**	**Revision**
☒	Field pH Measurement	100	R4
☒	Field Specific Conductance Measurement	101	R6
☒	Field Temperature Measurement	102	R5
☒	Field Turbidity Measurement	103	R4
☐	Groundwater Level and Well Depth Measurement	105	R3
☒	Field Measurement of Dissolved Oxygen	106	R4
☐	Field X-Ray Fluorescence (XRF) Measurement	107	R4
☐	Wastewater Flow Measurement	109	R4
☒	Global Positioning System	110	R4
☒	In-Situ Water Quality Monitoring	111	R4
☐	Field Measurement of Total Residual Chlorine	112	R5
☐	Field Measurement of Oxidation-Reduction Potential (ORP)	113	R2
	Field Sampling Procedures*	**SESDPROC-**	**Revision**
☐	Sediment Sampling	200	R3
☒	Surface Water Sampling	201	R4
☐	Soil Sampling	300	R3
☐	Groundwater Sampling	301	R4
☐	Waste Sampling	302	R3
☐	Ambient Air Sampling	303	R5
☐	Potable Water Supply Sampling	305	R3
☐	Wastewater Sampling	306	R4
☐	Soil Gas Sampling	307	R3
	Ecology Section Field Sampling Procedures*	**SESDPROC-**	**Revision**
☒	Hydrological Studies	501	R4
☐	Water Column Oxygen Metabolism	504	R4
☐	Reaeration Measurement by Diffusion Dome	505	R4
☐	Sediment Oxygen Demand	507	R4
☐	Multi-Habitat Macroinvertebrate Sampling in Wadeable Freshwater Streams	508	R4
☐	Marine Macroinvertebrate Field Sampling	511	R4
☐	Fish Field Sampling	512	R4
☐	Pore Water Sampling	513	R3
☐	Dye Tracer Measurements	514	R2
☐	Bottom Water Sampling for Sulfide	515	R0

***If procedures allow for different sampling and measurement methods, the utilized method(s) must be identified in the project description section. Additionally, verify procedure revision numbers before issuance of SAP.**

Section C: Reporting

C1. Reporting

Estimated Report Completion Date: 08/07/2019	
Is a Provisional Data Release Anticipated:	☒ **Yes**
	☐ **No**

Provisional data refers to final analytical and field measurement results that may be subject to further interpretation and/or data assessment by the project leader prior to the issuance of a final field investigation report. Provisional data may be provided prior to the completion of the LSASD final report only if LSASD management approves the release of the information and the analytical data have been released as final from the LSASD Laboratory Services Branch, for LSASD generated data, and/or the LSASD Quality Assurance Section, for non-LSASD generated data. Release of provisional data will be transmitted by electronic or hard copy with official correspondence from the Section Chief in accordance with the LSASD Operating Procedure for Report Preparation and Distribution (SESDPROC-003).

Additional Comments:

Provisional data may be released to EPA R4 Water Division pending issuance of final report for the purpose of planning a PFAS Phase 3 study.

References

Bisschops, I., & Spanjers, H., (2003). Literature review on textile wastewater characterization. Environmental Technology, 24:11, 1399-1411, https://doi.org/10.1080/09593330309385684.

Gaffney, P. E., (1976). Carpet and rug case study I: water and wastewater treatment plant operation. Water Pollution Control Federation, 48:11, 2590-2598, https://www.jstor.org/stable/25040060.

USEPA, (2004). Total maximum daily load (TMDL) development for nutrient enrichment in Lake Weiss. U.S. Environmental Protection Agency, Region IV, Atlanta, GA, http://adem.alabama.gov/programs/water/wquality/tmdls/FinalWeissLakeNutrientTMDL%282004Original%29.pdf.

USEPA, (2018*a*). Applied Science Branch Quality Assurance Project Plan. U.S. Environmental Protection Agency, Region 4, Laboratory Services & Applied Science Division, Athens, GA.

USEPA, (2018*b*). Laboratory Services Branch Laboratory Operations and Quality Assurance Manual. U.S. Environmental Protection Agency, Region 4, Laboratory Services & Applied Science Division, Athens, GA.

USEPA, (2018*c*). Phase 1: Study of PFAS Compounds on the Chattooga River (Project ID 18-0142). U.S. Environmental Protection Agency, Region 4, Laboratory Services & Applied Science Division, Athens, GA.

Site Figures and Tables

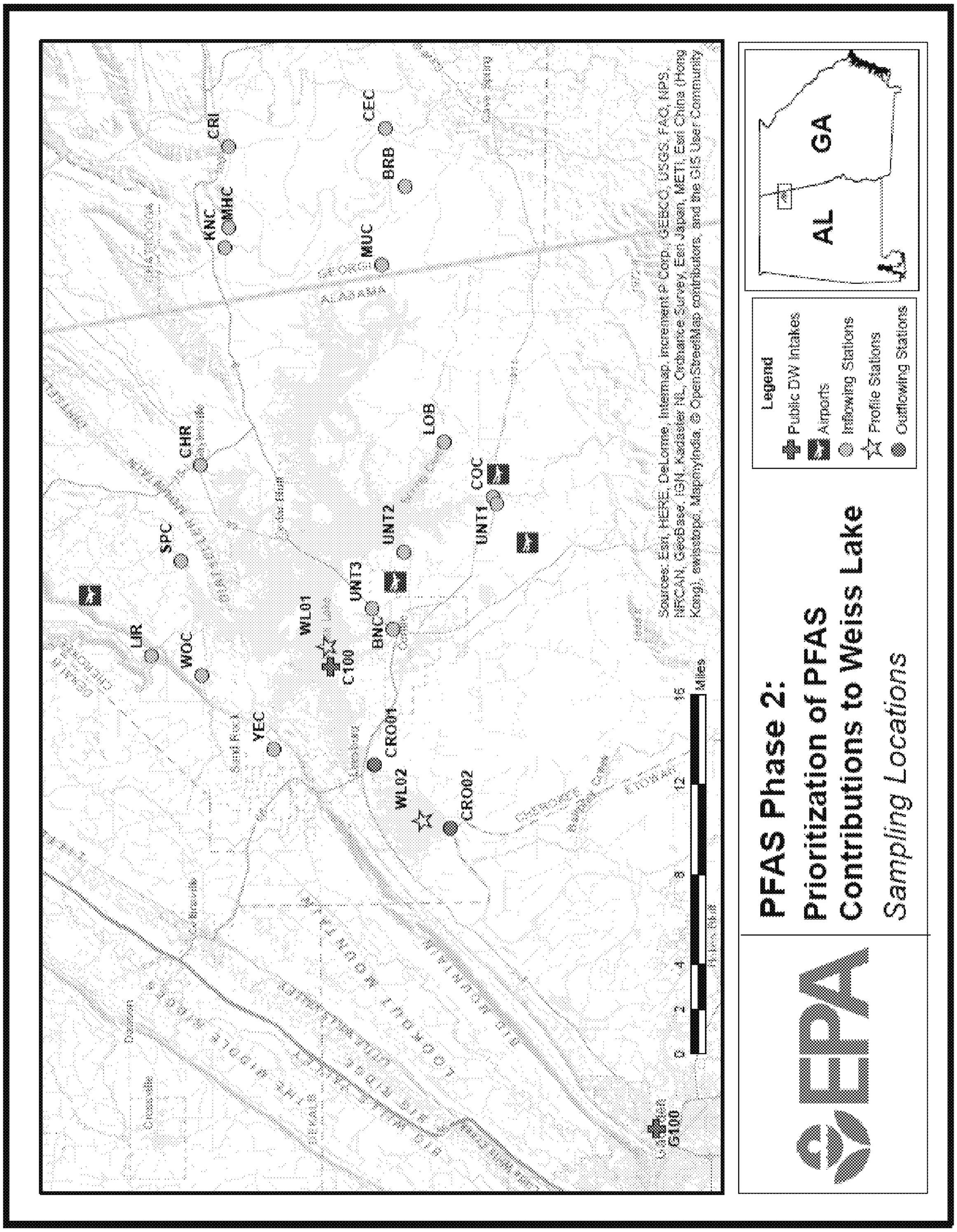

Figure 1: Weiss Lake Sampling Locations

<u>Table1:</u> List of Study Sites

Station ID	Water Body	Approximate Coordinates		Site Description
		Latitude	Longitude	
Inflowing Tributaries				
CRI	Coosa River	34.24861402	-85.35521788	Coosa River Inlet at HWY 100
MHC	Mt Hope Creek	34.24872233	-85.40739444	Mt. Hope Creek at Old River Road SW
KNC	Kings Creek	34.25069884	-85.42039899	Kings Creek at Old River Road SW
CEC	Cedar Creek	34.16566086	-85.34370886	Cedar Creek at HWY 100 Fosters Mill Rd
BRB	Brushy Branch	34.15523719	-85.38093898	Brushy Branch Dirt Rd off of Melso Rd SW
MUC	Mud Creek	34.16758198	-85.43139875	Mud Creek at George Rd SW RT 78
LOB	Locust Branch	34.13390344	-85.54553166	Boat in from RT 22 Crossing at Spring Creek
COC	Cowan Creek	34.10822400	-85.58090842	Cowan Creek at HWY 411
UNT1	Unkown Trib	34.10605316	-85.58478807	Unknown drainage Cherokee Cnty Regional Airport
YEC	Yellow Creek	34.22472082	-85.74292125	Yellow Creek at Rt 166
WOC	Wolf Creek	34.26327838	-85.69558742	Wolf Creek at HWY 273
LIR	Little River	34.28972051	-85.68288915	Little River Gorge National Preserve
UNT2	Unknown Trib	34.15529931	-85.61605997	Unknown drainage East of Centre Municipal_Airport
UNT3	Unknown Trib	34.17294415	-85.65244745	Unknown drainage West of Centre Munipal Airport
CHR	Chattooga River	34.26386001	-85.56027689	Chattooga River at Canyon Dr
SPC	Spring Creek	34.27418141	-85.62206945	Spring Creek at RT 75
BNC	Big Nose Creek	34.16167825	-85.66597315	Big Nose Creek at Cedar Bluff Rd
Outflowing Tributaries				
CRO01	Coosa River	34.17119716	-85.75309788	Weiss Dam at Cherokee Cnty 7
CRO02	Coosa River	34.13077811	-85.79378810	Weiss Dam at Cherokee Cnty 20
Vertical Profiling Stations				
WL01	Weiss Lake	34.19732178	-85.67673408	Weiss Lake Profile Station Near Centre Intake Midlake
WL02	Weiss Lake	34.14636705	-85.78911754	Weiss Lake Profile Station Above Weiss Dam
Public Drinking Water Intakes				
C100	Centre City DW Intake	Redacted	Redacted	Public drinking water for Centre City Alabama
G100	Gadsden DW Intake	Redacted	Redacted	Public drinking water for Gadsden Alabama

Table 2: List of Metals Analytes, Methods and MRLs

Region IV Laboratory Routine Metals Target Analyte List Minimum Reporting Limits (MRLs) for Surface Water		
Analyte	Method	MRL µg/L (ppb)
Arsenic	EPA 200.8	0.5
Aluminum	EPA 6010C	100
Barium	EPA 6010C	5
Beryllium	EPA 6010C	3
Cadmium	EPA 200.8	0.25
Calcium	EPA 6010C	250
Cobalt	EPA 6010C	5
Chromium	EPA 6010C	5
Copper	EPA 6010C	10
Iron	EPA 6010C	100
Lead	EPA 200.8	0.5
Magnesium	EPA 6010C	250
Manganese	EPA 6010C	5
Molybdenum	EPA 6010C	10
Nickel	EPA 6010C	10
Potassium	EPA 6010C	1000
Selenium	EPA 200.8	1
Sodium	EPA 6010C	1000
Strontium	EPA 6010C	5
Silver	EPA 6010C	5
Tin	EPA 6010C	15
Titanium	EPA 6010C	5
Thallium	EPA 200.8	0.5
Vanadium	EPA 6010C	5
Yttrium	EPA 6010C	3
Zinc	EPA 6010C	10

<u>Table 3:</u> List of Semi-VOA and PCB Analytes, Methods and MRLs

Region IV Laboratory Semi-Volatile Organics and PCBs Analyte List Minimum Reporting Limits (MRLs) for Surface Water		
Analyte	Method	MRL µg/L (ppb)
1,1'-Biphenyl	EPA 8270D	2
2-Methylnaphthalene	EPA 8270D	2
Aroclor 1221	EPA 8082A	1
Aroclor 1232	EPA 8082A	1
Aroclor 1242	EPA 8082A	1
Aroclor 1016	EPA 8082A	1
Aroclor 1248	EPA 8082A	1
Aroclor 1254	EPA 8082A	1
Aroclor 1260	EPA 8082A	1
Aroclor 1262	EPA 8082A	1
Aroclor 1268	EPA 8082A	1

<u>Table 4:</u> List of VOA Analytes, Method and MRLs

Region IV Laboratory Volatile Oragnics Analyte List Minimum Reporting Limits (MRLs) for Surface Water		
Analyte	Method	MRL µg/L (ppb)
1,2-Dichlorobenzene	EPA 8260C	0.5
1,3-Dichlorobenzene	EPA 8260C	0.5
1,4-Dichlorobenzene	EPA 8260C	0.5
1,2,3-Trichlorobenzene	EPA 8260C	0.5
1,2,4-Trichlorobenzene	EPA 8260C	0.5

Table 5: **List of Nutrients and Classical Analytes, Method and MRLs**

Region IV Laboratory Nutrients and Classicals Target Analyte List Minimum Reporting Limits (MRLs) for Surface Water		
Analyte	Method	MRL mg/L (ppm)
Ammonia	EPA 350.1	0.05
Chloride	EPA 300	0.1
Hardness, Calculated	SM 2340B	1.65
Nitrate	EPA 300.0/EPA 353.2	0.05
Nitrite	EPA 300.0/EPA 353.2	0.05
Phosphorus, Total	EPA 365.1	0.01
Total Dissolved Solids	USGS I-1750-85	40
Total Suspended Solids	USGS I-3765-85	4
Sulfate	EPA 300	0.1
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	0.05

<u>Table 6:</u> List of PFAS Analytes, Method and MRLs

Region IV Laboratory Per - and Polyfluoroalkyl Substances (PFAS) Target Analyte List Minimum Reporting Limits (MRLs) for Surface Water		
Analyte	Method	MRL µg/L (ppb)
Perfluorotetradecanoic acid (PFTeDA)	ASBPROC-800	0.08
Perfluorotridecanoic acid (PFTrDA)	ASBPROC-800	0.04
Perfluorododecanoic acid (PFDoA)	ASBPROC-800	0.04
Perfluoroundecanoic acid (PFUDA)	ASBPROC-800	0.04
Perfluorodecanoic acid (PFDA)	ASBPROC-800	0.04
Perfluorononanoic acid (PFNA)	ASBPROC-800	0.04
Perfluorooctanoic acid (PFOA)	ASBPROC-800	0.04
Perfluoroheptanoic acid (PFHpA)	ASBPROC-800	0.04
Perfluorohexanoic acid (PFHxA)	ASBPROC-800	0.04
Perfluoropentanoic acid (PFPeA)	ASBPROC-800	0.04
Perfluorobutyric acid (PFBA)	ASBPROC-800	0.04
Perfluorodecanesulfonate (PFDS)	ASBPROC-800	0.04
Perfluorononanesulfonate (PFNS)	ASBPROC-800	0.04
Perfluorooctanesulfonate (PFOS)	ASBPROC-800	0.04
Perfluoroheptanesulfonate (PFHpS)	ASBPROC-800	0.04
Perfluorohexanesulfonate (PFHxS)	ASBPROC-800	0.04
Perfluoropentanesulfonate (PFPeS)	ASBPROC-800	0.04
Perfluorobutanesulfonate (PFBS)	ASBPROC-800	0.04
Perfluorooctanesulfonamide (FOSA)	ASBPROC-800	0.04
Fluorotelomer sulfonate 8:02 (8:2 FTS)	ASBPROC-800	0.04
Fluorotelomer sulfonate 6:02 (6:2 FTS)	ASBPROC-800	0.04
Fluorotelomer sulfonate 4:02 (4:2 FTS)	ASBPROC-800	0.04
N-ethyl-N-((heptadecafluorooctyl)sulfonyl)glycine (N-EtFOSAA)	ASBPROC-800	0.04
N-(Heptadecafluorooctylsulfonyl)-N-methylglycine (N-MeFOSAA)	ASBPROC-800	0.04
Hexafluoropropylene oxide–dimer acid (HFPO-DA)	ASBPROC-800	0.04

Table 7: Sample Collection, Preservation and Holding Times

Analyses	Matrix	Container	Preservation	Holding Time
Metals + Hardness	Surface Water	1-liter Polyethylene	HNO_3 (pH < 2), Ice (≤ 4°C)	6 months
Semi-Volatile Organics + PCBs		2 x 1-liter Glass Amber	Ice (≤ 4°C)	47 days
Volatile Organics		3 x 40mL Glass Vial with Septum Seal	0.2 mL 1+1 HCL (pH < 2), Ice (≤ 4°C)	14 days
Nutrients (Nitrogen Series + Total P)		1-liter Polyethylene	H_2SO_4 (pH < 2), Ice (≤ 4°C)	28 days
Classicals (TSS, TDS, Cl-, & Sulfates)		1-liter Polyethylene	Ice (≤ 4°C)	7 days (solids) 28 days (Cl- + sulfates)
PFAS		2 x 15mL Polypropylene Vial	Ice (≤ 4°C)	42 days

Table 8: *In-situ* Water Quality Measurement Uncertainty

Parameter	Units	Technology	Measurement Sensitivity
pH	S.U.	Glass Electrode	± 0.2 SU
Dissolved Oxygen	mg/L	Luminescent DO Probe	± 0.2 mg/l ± 2% of reading (whichever is greater)
Temperature	°C	LDO Thermistor	± 0.2 °C
Specific Conductance	μS/cm	Nickel Electrode Cell	± 0.5% of reading
Turbidity	NTU or FNU	Portable Turbidimeter (EPA 180.2) Optical Probe (ISO 7027)	± 5% of reading

END OF DOCUMENT